MAP GQ-1616

DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

GEOLOGIC MAP OF THE VIRGINIA DALE QUADRANGLE, LARIMER COUNTY, COLORADO, AND ALBANY AND LARAMIE COUNTIES, WYOMING

By William A. Braddock, David H. Eggler, and Terry R. Courtright

GEOLOGIC QUADRANGLE MAP
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BRADDOCK AND OTHERS—GEOLOGY, VIRGINIA DALE QUAD., COLORADO AND WYOMING 1:24,000 MAP GQ-1616

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DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Base from U.S. Geological Survey, 1967
10,000-foot grids based on Colorado coordinate system, north zone, and 1000-meter Universal Transverse Mercator grid ticks, zone 13, shown in blue

APPROXIMATE MEAN DECLINATION, 1989

SCALE 1:24 000

1 ½ 0 1 MILE
1 .5 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

See index to geologic mapping units

COLORADO
QUADRANGLE LOCATION

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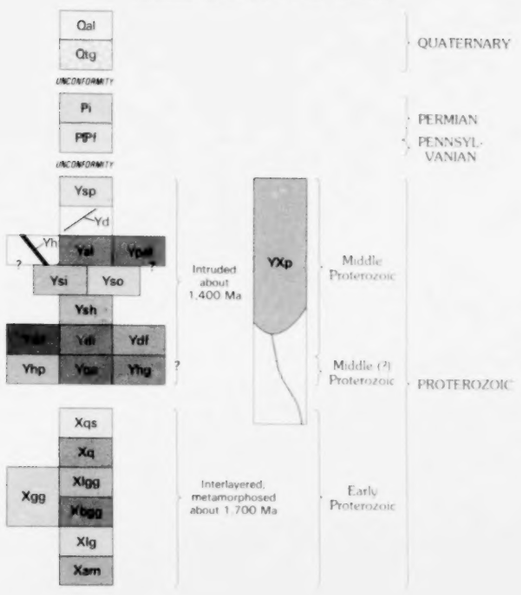
GEOLOGIC QUADRANGLE MAP
VIRGINIA DALE QUADRANGLE, CO — WY
GQ–1616

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

[Names for igneous rocks are after Streckeisen, 1976]

Qal **Alluvium (Quaternary)**—Unconsolidated silt, sand, and gravel. Includes colluvium along valley walls

Qtg **Gravel deposits on terraces and pediments (Quaternary)**—Reddish-brown, very coarse grained sand and granule- to pebble-size gravel and some cobbles. Minor layers of fine-grained sand and silt. Most of the deposit closely resembles gruss weathered from the Sherman Granite and could not be differentiated from the Sherman where it directly overlies the granite

Pi **Ingleside Formation (Lower Permian)**—Reddish-pink, fine-grained quartz sandstone. Only the basal few feet exposed on east edge of quadrangle

PIPf **Fountain Formation (Lower Permian and Upper and Middle Pennsylvanian)**—Reddish-brown to purplish-gray and white arkosic conglomerate and medium- to coarse-grained arkosic sandstone and dark-reddish-brown siltstone and shale. Minor thin limestone. About 650 feet (198 m) thick

INTRUSIVE IGNEOUS ROCKS
(MIDDLE PROTEROZOIC)

Ysp **Silver Plume Granite**—Fine- to medium-grained, equigranular to seriate, porphyritic biotite-muscovite granite. Northern limit of Log Cabin batholith (of Silver Plume Granite) along southern margin of quadrangle. Whole-rock Rb-Sr age is 1,390±30 Ma (recalculated from Peterman and others, 1968, p. 2290, using IUGS decay constants in Steiger and Jäger, 1977)

Areas of Silver Plume Granite containing abundant pegmatite (YXp)

Yd **Mafic dikes**—Gray to black, fine- to medium-grained rocks generally containing zoned, clouded, and altered plagioclase phenocrysts. Texture of the dikes commonly subophitic but may be hypidiomorphic-granular. Both biotite and hornblende are abundant. A mafic dike in northwest corner of the Livermore quadrangle (see index map) is cut by pegmatite of assumed Silver Plume age. Mafic dikes in north-central part of Livermore Mountain quadrangle (see index map) are cut by pegmatite of assumed Silver Plume age and by Silver Plume Granite (Ysp)

Yh **Hornblende granite**—Pink, fine- to medium-grained, equigranular; contains scattered clusters of hornblende and biotite. Color index is about 6 percent. Forms northwest-trending dike in northeast part of quadrangle. Hornblende granite is cut by mafic dikes (Yd) in southern Wyoming (See Eggler, 1968, plate 3, where pad = Yd, hmd = Yh). Hornblende granite cuts main phase of Sherman Granite (Ysh) in the northeast part of the Diamond Peak quadrangle

Yai **Alaskite**—Pink to red, fine-grained biotite granite aplite. Forms dikes generally parallel to margin of Virginia Dale ring structure. Alaskite dikes are cut by mafic dikes (Yd) near northwest corner of quadrangle. The alaskite dikes cut inner Cap Rock phase of Sherman Granite (Ysi) in northeast corner of Cherokee Park quadrangle and cut outer Cap Rock phase (Yso) in northwest part of this quadrangle

Ypai **Porphyritic alaskite**—Fine-grained biotite aplite containing phenocrysts of microcline, plagioclase, and quartz. Forms three small bodies near northern edge of quadrangle. Porphyritic alaskite cut by mafic dikes (Yd) in southern Wyoming (see Eggler, 1968, plate 3, where pad = Yd, pal = Ypal). Porphyritic alaskite cuts hornblende gabbro (Yhg) in northwest corner of quadrangle. Correlative with alaskite (Yai) because of similarities in composition and occurrence

Sherman Granite—Forms Sherman batholith which crops out in most of this quadrangle, most of Cherokee Park quadrangle, northern part of the Diamond Peak quadrangle, and northward from these quadrangles into southern Wyoming. Virginia Dale ring structure occurs along southern margin of batholith. The Sherman Granite has been subdivided (Eggler, 1967, 1968) into the inner and outer Cap Rock phases, which occur within the ring structure, and the main phase (the "Trail Creek granite facies" of Eggler, 1968), which forms most of the batholith and the outermost ring of the ring structure. Chemical analyses of Sherman Granite (and associated rocks) published in Eggler (1968) and in Galipeau and Ragland (1979). Whole-rock Rb-Sr age of the main phase is 1,430±20 Ma (Zielinski and others, 1981)

Ysi **Inner Cap Rock phase**—Pinkish-gray, porphyritic, biotite monzogranite. Foliation defined by oriented, tabular, microcline phenocrysts; biotite-rich streaks; and oriented, tabular inclusions. Cut by a stock of Silver Plume Granite (Ysp) and mafic and alaskite dikes (Yd and Yai) in northeast part of the Cherokee Park quadrangle and by mafic and biotite monzogranite dikes (Yd and Yb) in the northwest part of the Cherokee Park quadrangle

Yso **Outer Cap Rock phase**—Similar to inner Cap Rock phase (Ysi), but phenocrysts are smaller, planar orientation of phenocrysts better, and biotite streaks more abundant. Contact between the inner and outer Cap Rock phases gradational over several hundred meters. Cut by bodies of Silver Plume Granite (Ysp) near Turkey Roost in southern part of the Cherokee Park quadrangle, by mafic dikes (Yd) in sec. 6, T. 11 N., R. 72 W. in Diamond Peak quadrangle, and by alaskite dikes (Yai) in northwest part of Virginia Dale quadrangle

Ysh **Main phase**—Red to pink, coarse-grained, equigranular granite composed of quartz, microcline, oligoclase, and 5–10 percent hornblende and biotite. Cut by bodies of Silver Plume Granite (Ysp) near Turkey Roost in southern part of Cherokee Park quadrangle, mafic dikes (Yd) in southwest part of Virginia Dale and northwest part of Diamond Peak quadrangles, and by dikes of outer Cap Rock phase (Yso) in sec. 1, T. 11 N., R. 73 W. in Diamond Peak quadrangle

Area of Sherman Granite containing abundant inclusions of metamorphic rock

Dioritic rocks of Virginia Dale ring structure—A discontinuous, arcuate body of dioritic rock occurs in eastern and southern part of ring structure and contains principally fine-grained diorite and diorite. Bodies of diorite feldspathized by Sherman Granite are also shown. Dioritic rocks are cut by Silver Plume Granite (Ysp) in southeast part of Cherokee Park quadrangle and by alaskite (Yai) in this quadrangle in sec. 3, T. 11 N., R. 71 W. and in sec. 34, T. 12 N., R. 71 W. Dioritic rocks are cut by many small bodies and dikes of outer Cap Rock phase of Sherman Granite (Yso) in this quadrangle and Cherokee Park quadrangle and appear to be sharply cut by main phase of Sherman Granite (Ysh) along the inner contact of the outer ring dike in this quadrangle

Ydf **Fine-grained diorite**—Black, subophitic to ophitic, composed of andesine, amphibole, biotite, quartz, and opaque minerals

Ydi **Diorite**—Black to gray, medium-grained, subophitic to ophitic or hypidiomorphic-granular, composed of andesine, hornblende, biotite, quartz, microcline, and opaque minerals

Ydf **Feldspathized diorite**—Contains conspicuous megacrysts of microcline and quartz

Composite zone of the Virginia Dale ring structure—This zone is the arcuate mass between the outer Cap Rock phase (Yso) and the outer ring dike composed of the main phase of the Sherman Granite (Ysh). Zone consists mostly of dioritic rocks, older quartzofeldspathic mica schist (Xqs), and hornblende gneiss (Xam). Many dikes and lenses of outer Cap Rock phase (Yso) cut the composite zone, but only larger ones are mapped. Adjacent to these dikes and lenses, hybrid rocks intermediate in composition between monzogranite and diorite occur and may have formed by reaction between monzogranite and host rocks—possibly involving mobilization (Eggler, 1968), or they may have formed by mixing of simultaneously intruded diorite and monzogranite magmas (Ray Wilcox, U.S. Geological Survey, oral commun., 1970). These hybrid rocks have not been separately mapped

INTRUSIVE IGNEOUS ROCKS
(MIDDLE? PROTEROZOIC)

Yhp **Porphyritic hornblende monzogranite**—Tan to reddish-tan, fine-grained, xenomorphic-granular; contains phenocrysts predominantly of quartz but some microcline and sparse oligoclase. Hornblende and biotite comprise about 5 percent of the rock. Monzogranite is cut by hornblende granite dikes (Yh) in northeast part of Diamond Peak quadrangle, by alaskite dikes (Yai) in northwest corner of this quadrangle, and by main phase of the Sherman Granite (Ysh) in northwest corner of this quadrangle and in northeast part of Diamond Peak quadrangle. Maximum relative age of monzogranite not known because it cuts only Early Proterozoic metamorphic rocks (it is in contact with hornblende gabbro (Yhg), but no relative age criteria were observed)

Yqa **Quartz-bearing anorthosite**—Medium-gray, very coarse grained, composed primarily of andesine and small amounts of hornblende, biotite, and quartz. Small body in sec. 35, T. 11 N., R. 71 W. near Halligan Reservoir. Relative age unknown

Yhg **Hornblende gabbro**—Black, medium-grained, nonfoliated, composed of hornblende, labradorite, and minor biotite and pyrite. Has ophitic to subophitic texture. Occurs along northern border of quadrangle. Hornblende gabbro cut by mafic, porphyritic alaskite, and alaskite dikes (Yd, Ypai, and Yai, respectively) and by main phase of Sherman Granite (Ysh) in northwest corner of quadrangle. Maximum relative age unknown

YXp **Pegmatite (Middle and Early Proterozoic)**—Fine-grained to very coarse grained. Most of the pegmatites in this quadrangle are Middle Proterozoic age, but some are Early Proterozoic age. They are not easily distinguishable from each other

METASEDIMENTARY AND METAVOLCANIC ROCKS (EARLY PROTEROZOIC)

Mica schist (Xqs) and quartzite (Xq) units are metasedimentary rocks; granitic gneiss (Xlgg, Xbgg, Xgg) and hornblende gneiss and amphibolite (Xam) probably are metavolcanic rocks. These rocks have been metamorphosed to upper amphibolite facies. The schists are migmatitic and are characterized by the mineral assemblage of sillimanite-microcline-plagioclase-quartz-biotite-magnetite±garnet. Regional metamorphism dated at 1,713±30 Ma (whole-rock Rb-Sr age recalculated from Peterman and others, 1968, p. 2284, using IUGS decay constants in Steiger and Jäger, 1977). Time of deposition cannot be much older, because Sm-Nd isotope analyses are consistent with a model age of 1,800 Ma for formation of continental crust in Colorado (DePaolo, 1981)

Xqs **Quartzofeldspathic mica schist**—Biotite schist interbedded with quartzofeldspathic granofels. Migmatitic

Xq **Quartzite**—Light-gray, medium-grained, composed of quartz and minor biotite, muscovite, apatite, and opaque minerals. Occurs in secs. 10 and 11, T. 11 N., R. 71 W.

Granitic gneiss—Gray, pink, or red, weakly to strongly foliated, composed primarily of plagioclase, quartz, and microcline and generally less than 15 percent dark minerals

Xgg **Granitic gneiss**—Small inclusions in Sherman Granite (Ysh) in the northeast part of the quadrangle

Xlgg **Leucocratic granitic gneiss**—Dominantly fine-grained. Some aplitic layers almost devoid of dark minerals, some layers contain very little microcline, and some grade into hornblende gneiss. Foliation due to fine-scale compositional layering and to oriented biotite

Xbgg **Biotite granitic gneiss**—Dominantly medium-grained. Biotite content averages about 10 percent. Foliation due to oriented biotite and to discontinuous, anastomosing seams rich in biotite. Locally nonfoliated

Xlg **Leucocratic gneissic pegmatite**—White to pink, fine- to very coarse grained, weakly foliated gneiss composed of quartz, plagioclase, and microcline

Xam **Hornblende gneiss and amphibolite**—Dark-gray to black, weakly to strongly layered, composed chiefly of hornblende and plagioclase. Contains thin layers and pods of white to light-green calc-silicate gneiss

Contact—Approximately located; queried where uncertain. Contacts of Pennsylvanian and Permian formations are solid where exposed, dashed where unexposed

Fault or fracture zone—Showing dip and bearing of slickensides where known. Dashed where approximately located; dotted where concealed

Prominent joints—Visible on aerial photographs

Fold—Showing approximate trace of axial surface. Dashed where inferred. Form of fold shown by following symbols

Overturned antiform

Syncline

Synform

Monocline

Strike and dip of beds
Inclined

Horizontal

Strike and dip of foliations—May be combined with lineation symbols
Schistosity
Inclined

Vertical

Folded—Showing map view and dip of long limbs

Primary flow foliation in intrusive igneous rocks
Inclined

Vertical

Bearing and plunge of lineations—May be combined with foliation symbols

Axes of multiple symmetric folds—Showing map view of fold

Small folds, boudinage, and aligned minerals

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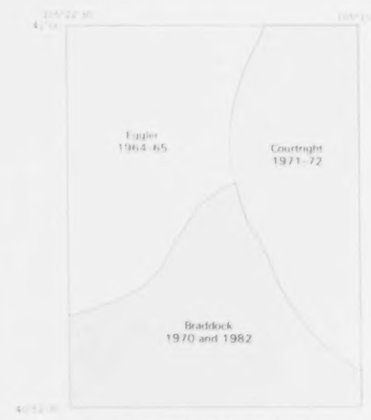

INDEX TO GEOLOGIC MAPPING

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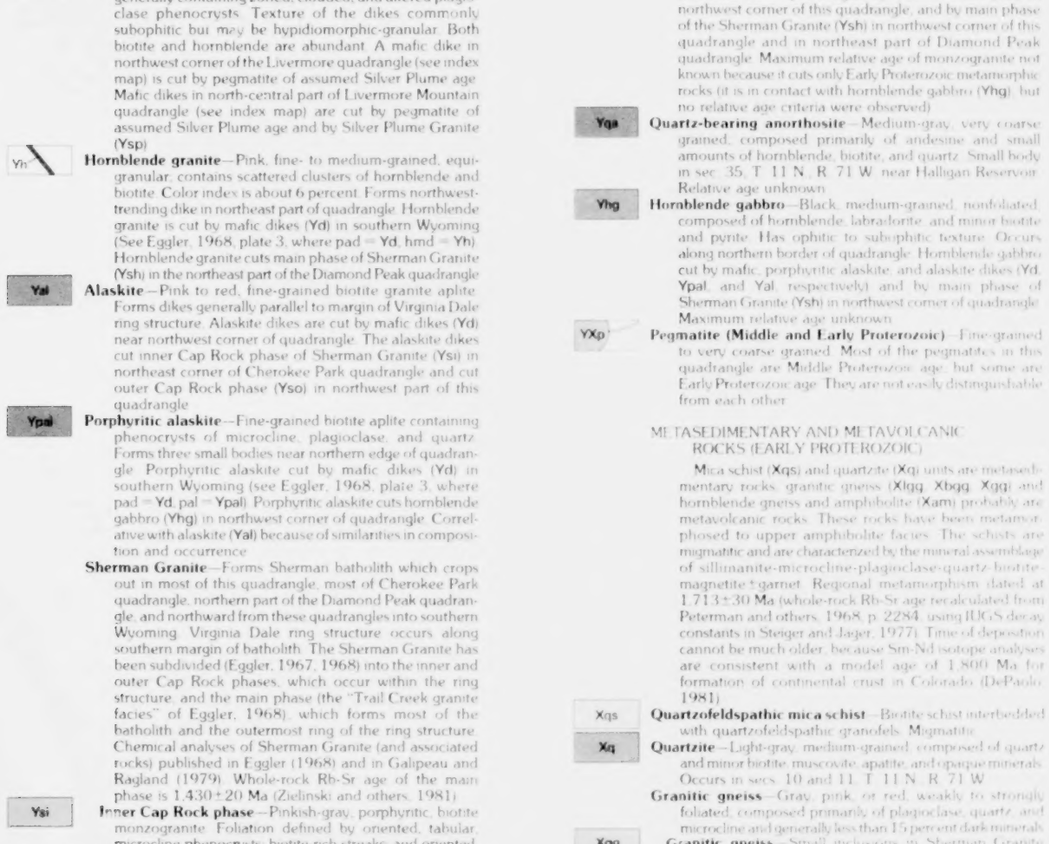

EXPLANATION

QP Quaternary, Permian, and Pennsylvanian rocks

Ysp Silver Plume Granite

Ysi Sherman Granite, inner Cap Rock phase

Yso Sherman Granite, outer Cap Rock phase

Ysh Sherman Granite, main phase

Ydi Dioritic rocks

Xm Principally metamorphic rocks

Contact

Fault or fracture zone—Dashed where approximately located

INDEX MAP SHOWING THE VIRGINIA DALE RING STRUCTURE

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GEOLOGIC MAP SYMBOLS

COMMONLY USED ON MAPS OF THE UNITED STATES GEOLOGICAL SURVEY
(Special symbols are shown in explanation)

Contact – Dashed where approximately located; short dashed where inferred; dotted where concealed

Contact – Showing dip; well exposed at triangle

Fault – Dashed where approximately located; short dashed where inferred; dotted where concealed

Fault, showing dip – Ball and bar on downthrown side

Normal fault – Hachured on downthrown side

Fault – Showing relative horizontal movement

Thrust fault – Sawteeth on upper plate

Anticline – Showing direction of plunge; dashed where approximately located; dotted where concealed

Asymmetric anticline – Short arrow indicates steeper limb

Overturned anticline – Showing direction of dip of limbs

Syncline – Showing direction of plunge; dashed where approximately located; dotted where concealed

Asymmetric syncline – Short arrow indicates steeper limb

Overturned syncline – Showing direction of dip of limbs

Monocline – Showing direction of plunge of axis

Minor anticline – Showing plunge of axis

Minor syncline – Showing plunge of axis

Strike and dip of beds – Ball indicates top of beds known from sedimentary structures

Inclined Horizontal

Vertical Overturned

Strike and dip of foliation

Inclined Vertical Horizontal

Strike and dip of cleavage

Inclined Vertical Horizontal

Bearing and plunge of lineation

Inclined Vertical Horizontal

Strike and dip of joints

Inclined Vertical Horizontal

Note: planar symbols (strike and dip of beds, foliation or schistosity, and cleavage) may be combined with linear symbols to record data observed at same locality by superimposed symbols at point of observation. Coexisting planar symbols are shown intersecting at point of observation.

Shafts

Vertical Inclined

Adit, tunnel, or slope

Accessible Inaccessible

Prospect

Quarry

Active Abandoned

Gravel pit

Active Abandoned

Oil well

Drilling Shut-in Dry hole abandoned

Gas Show of gas

Oil Show of oil

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